NASA TECH BRIEF

Simple Quasi-Exponential Slope Generator

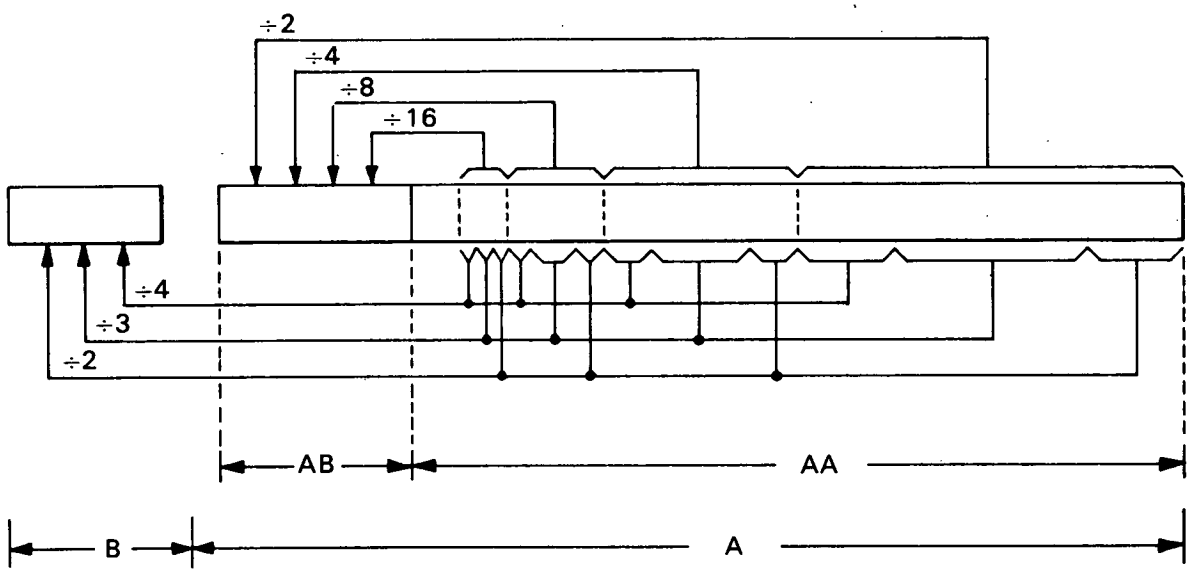

Figure 1

Circuitry has been devised for digitally generating an exponentially decaying wave function (such as from a discharging capacitor). Its purpose is to permit discrete values to be sampled from the exponential waveform for comparison with a binary number of a specified accuracy. The special-purpose exponential-decay generator employs a simple binary counter designed to count in the sequence of exponential decay. Although available arbitrary, random, and general-purpose digital sequence or function generators would be applicable, they are of greater complexity than the present circuitry.

As shown in Figure 1, a standard binary counter, A, is regarded as consisting of two sections: a binary field counter, AA, and a field-control counter, AB. The subfield counter, B, is a simple shift-register counter. The length of each counter, as well as the gating structure, may be increased or decreased as required.

The truth table (not shown) for section AA is divided into fields starting at full scale. Each field is half of the preceding field. The outputs of simple gating structures covering these fields control the input clock. Counting from full scale to half scale, full clock rate is applied. Counting from half scale to 1/4 scale, 1/2 clock rate is applied, i.e., one stage of section AB is included in the counting chain. Counting from 3/4 to 7/8, one-fourth of the clock rate is applied, i.e., two stages of AB are included. Counting from 7/8 to 15/16, one-eighth of the clock rate is applied, i.e., three stages of AB are included, etc. To smooth the function further, each field of AA is divided

(continued overleaf)

into three subfields, the upper 1/4, the center 1/2, and the lower 1/4 field. These sub fields are easily covered by simple two-term gates, which in turn are controlled by the major field gates. For each field, the slope is changed from 1/2 for the first 1/4 to 1/3 for the center 1/2, and 1/4 for the lower 1/4. This is accomplished by an *or* operation on all upper, center, and lower subfields, and controlling an input counter with these *or* terms so as to divide by 2,3, and 4 respectively. Figure 2 shows the actual wave form produced.

Note:

Documentation is available from:

Clearinghouse for Federal Scientific and Technical Information
Springfield, Virginia 22151
Price $3.00
Reference: TSP69-10439

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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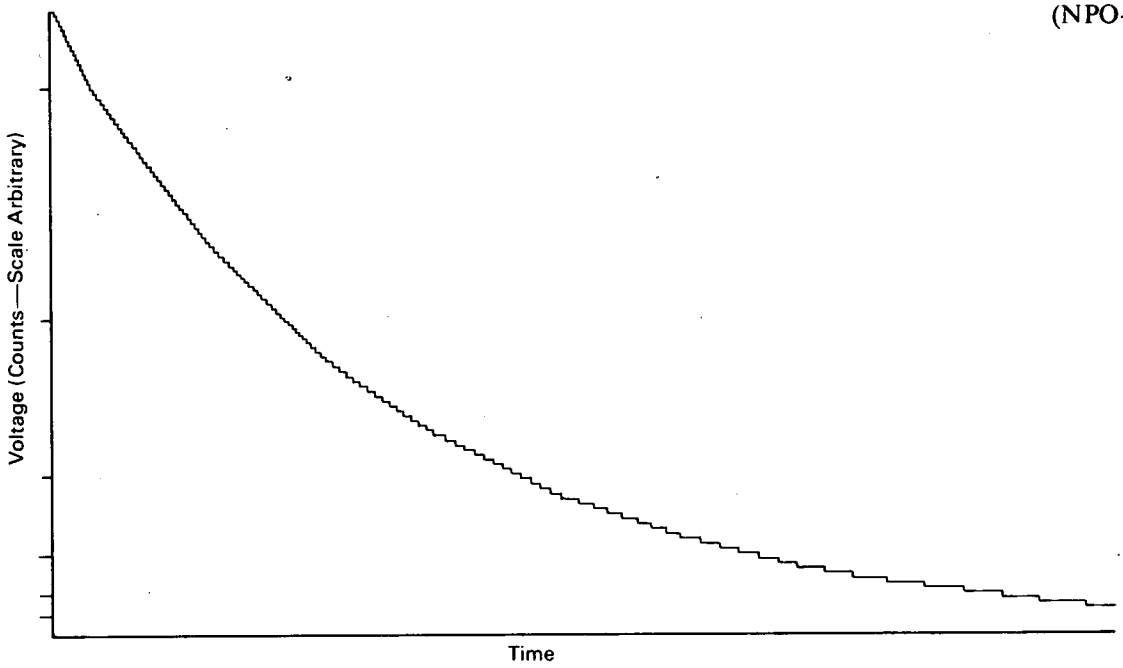

Figure 2.